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ABSTRACT

Whether there is a difference in the performance of public school and private school students on the advanced placement (AP) tests of the College Board was studied. The sample was composed of 216 public high schools, 32 Catholic high schools, and 24 other private high schools in Northern California, all of which gave their students at least five AP examinations. Subsamples were used to compare schools in the same locality. In the sample as a whole, private school students slightly (but not significantly) outperformed public school students. In a subsample of 148 schools, comprised of 44 schools with highly developed preparation programs and 104 schools which might compete for students with these schools, Catholic school students were outperformed by public school students, and public school students were outperformed by other private school students. Catholic schools were less likely than other private schools to have highly developed programs of preparation for the tests. This study demonstrates that the sector the school occupies has no significant influence on this aspect of student performance and illustrates the importance of the quality of the school's program on performance on AP tests. Four tables give information on students test results. (SLD)

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Do Public and Private Schools Differ in the Performance of Their Students on Advanced Placement Tests?

by

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"There is general consensus that on the average, Catholic high school students outperform public high school students on achievement tests." --- Edward Haertel (1987, p.3)

This statement, found at the beginning of Haertel's chapter, reflects, if not the conventional wisdom, at least the opinion of the many parents who, although not Catholic, have opted to send their children to Catholic schools (Coleman, Hoffer, and Kilgore, 1981; Coleman and Hoffer, 1987; Schneider and Slaughter, 1983). Is this perception, based in large part on the highly publicized studies by Coleman, Hoffer and Kilgore (1981, 1982a) and Hoffer, Greeley, and Coleman (1985), accurate?

The analyses of Coleman, Hoffer and Kilgore, using the High School and Beyond (HSB) base year data, and, to a lesser extent, those of Hoffer, Greeley, and Coleman, using the follow-up data, have been dissected by those skilled in statistical analysis. However, "different investigators' interpretations [have] ranged all the way from the position that overall sector differences [are] negligible to the position that there [is] a substantial Catholic sector advantage with strong implications for educational policy. [Furthermore,] rather than supporting some of these conclusions and refuting others, it appears that the follow-up data have essentially confirmed the earlier positions of everyone using the new data to test their original findings." (Haertel, James, and Levin, p.6)

Much of the discussion about the various analyses of the HSB

data has revolved either about the treatment of background variables or about what constitutes genuine significance. (Haertel, 1987; Alexander, 1987; both include reviews of other studies). However, the question of the validity of the HSB test battery as a measure of sophomore to senior academic growth has also been raised (Heyns and Hilton, 1982; Goldberger and Cain, 1982; Cain and Goldberger, 1983; Haertel, 1987; Willms, 1984, 1987). Willms writes: "None of the High School and Beyond tests appears to be an adequate measure of academic growth during the intervention period....If the tests had measured more advanced skills in biology, physics, chemistry, mathematics and English, then we might have observed a significant private schooling effect. At present, this must remain an open question (1987, pp.129-130)."[1]

Providing a partial answer to that open question is the purpose of this study. It asks if there is a difference in the performance of public and private school students on one of the achievement test batteries given annually to thousands of American high school students, the advanced placement (AP) tests administered by the College Board. If private school students perform better than public school students on these tests, the findings of Coleman, Hoffer, and Kilgore and of Hoffer, Greeley, and Coleman will have been given an independent boost. If, on the other hand public students score as well as private school students, it would indicate that on this dimension sector is not

a crucial factor in determining student outcomes.

Method

Sample

The sample comprises the 272 Northern California[2] high schools which, in the spring of 1987, gave at least five advanced placement exams.[3] The majority of these institutions, 216, are public; 32 are Catholic; and 24 are other private schools. A summary of their AP examination scores was obtained. For each school and for each of the 26 exams administered in 1987, this summary consists of the number of exams scored 1, 2, 3, 4, and 5, respectively.[4]

Because the test is one that students normally take at the end of a year of study, individual data about the students is not collected. Furthermore, aggregate student data is unavailable for most of the schools.[5] However, the nature of the research makes it desireable for student background influences to be considered. This was accomplished in two ways. First, subsamples were specified to control partially for background factors. Second, in a random subsample of 12 schools, the procedures for admitting students to advanced placement classes were checked for comparability.

Designed to compare public schools with the private schools likely to compete with them for students, subsample P/P consists of 201 schools: all 56 private schools and the 145 public schools located within 15 miles of at least one of the private schools.

Previous research (Bodenhausen, 1988) indicated that the number of exams given by a school is significantly related to its students' test scores. Subsample HDP1 was designed to compare 44 schools with highly developed programs. The 26 public schools gave at least 125 exams; the 19 private schools (7 Catholic, 11 other private) gave at least 60. These numbers were chosen as a reasonable number of exams to expect from a school with at least 5 AP classes, assuming an average class size of 25 in public schools and 12 in private ones.[6]

In order to look at schools likely to compete with the schools in HDP1, subsample HDP2 was defined consisting of the schools in HDP1, public schools located within 15 miles of a private school in HDP1, and private schools within the same distance of a public school in HDP1. Of the 143 schools in HDP2, 102 are public, 25 are Catholic, and 21 are other private.[7]

The assignment procedures survey

The AP coordinators at twelve randomly selected schools were contacted and asked how students are admitted to their AP math,

English, science, foreign language, and American history classes. While the responses take individual school conditions into consideration, they are markedly similar. For AP classes in which success is dependent upon writing ability, prospective students are required to demonstrate appropriate writing and analysis skills before being permitted to enroll. For AP classes in which success is dependent upon mastery of prerequisite classes, verification (beyond just a passing grade) of that mastery is required (usually by a combination of teacher recommendation, exam, and interview). Because, according to all of the coordinators, their schools' procedures are based upon recommendations from the College Board, it is likely that other schools also use comparable procedures.

Variables

Dichotomous variables were defined specifying sector and subsample inclusion.

The endogenous variables of the study were defined as the percentage of exams scored 3, 4, or 5 (3+) for the school as a whole and for each of the following exams (if administered): American history, biology, chemistry, English language and composition, English literature and composition, French language, calculus AB, calculus BC, and Spanish language.

While average exam scores were available for each school and for each subject, they were not used in the analysis because they are more influenced by student ability than are passing scores.[3]

Analysis and Results

In the sample as a whole and in each subsample, the means of each of the endogenous variables were tested for significant difference between sectors. Table 1 summarizes these values.

Insert Table 1 about here

For the sample as a whole and for subsample P/P, they did not differ significantly by sector. In both, the means were very slightly higher for private schools and quite a bit higher for non-Catholic private schools. However, any desire to attach importance to the other-private figures should be tempered by the fact that 46% of those schools had highly developed programs whereas only 22% of Catholic schools and 13% (12% in the sample as a whole) of public schools fell into that category.

When the means for subsamples HDP1 and HDP2 are compared with that of P/P, the difference is significant, for HDP1 at the

.01 level and for HDP2 at the .05 level. Furthermore, within HDP2, public school means exceed those of private schools, although not those of non-Catholic private schools. This was true even though only about one-quarter of the public schools were from HDP1 whereas one-third of the Catholic schools and over half of the other private schools came from that group.

Correlation coefficients between the sector and the endogenous variables were computed. The results were similar. Except for subsample HDP2, the first digit after the decimal point of the coefficient was "0;" for that subset, the first digit was 1 or 2 with the sign indicating the very slight advantage belonged to public schools.

Sector and the number of exams given by the school were regressed on each of the endogenous variables. Table 2 presents a summary.

Insert Table 2 about here

The resulting equations indicate that sector is not significant in determining student exam scores. The number of exams given by the school, however, has a significant (at .01 level) relationship to student performance on AP tests.

Finally, analyses were conducted within the subject areas of

calculus (AB &BC),[9] American history, biology, chemistry, English language and composition, English literature and composition, French language, and Spanish language. Except for calculus, these were means analyses only. Because students entering AP math classes have comparable math backgrounds[10] and are unlikely to have taken any calculus prior to beginning its study in an AP class,[11] regressions were also computed for that subject.

Table 3 presents a summary of means by subject area.

Insert Table 3 about here

While the highest mean percent of students passing the exam was found in other private schools for most subjects, a higher percent of public school students passed the math exams. There were only three instances of the sector mean differing significantly (at the .05 level) from the P/P mean: the English literature mean for other private schools was significantly above it; the French mean for Catholic schools and the BC calculus mean for other private schools were significantly below it.

Regressions were calculated for a subsample designated MATH -- all schools in P/P which gave at least 5 exams in either AB or BC calculus [59.3 % of the public schools in P/P (86 schools);

46.9% of the Catholic schools in P/P (15 schools); 62.5% of the other private schools in P/P (15 schools)] -- and for a subsample designated MATH/HDP2. Table 4 summarizes the regressions.

Insert Table 4 about here

In both cases, the number of exams was the only significant variable (at .01 level).

Discussion

Talbert (1988, p.161) writes, "The current reform movement in US public education is bolstered by claims that private schools do better than public schools. Documents such as the highly publicized report of Coleman, Hoffer and Kilgore (1981; see also 1982a and 1982b) have credited the private sector with superior academic productivity...." But he also notes (p.137) that "...subsequent analyses tend to challenge the claim that private schools are academically superior to public schools, after student selection and curricular placements are adequately taken into account...."

Coleman, Hoffer and Kilgore's study used the HS3 test which emphasized basic skills. Their conclusions, as noted above, have

been challenged primarily on the basis the lack of controls for student selection and curricular placements. However, some of their critics raised the inadequacy of the HSB test as a measure of a significant private schooling effect (see, for example, Heyns & Hilton, 1982; Willms, 1984; & Haertel, James, & Levin, 1987). This study provides evidence the concerns about the nature of the HSB test are well founded.

Potential confounding factors were addressed. While student body information was unavailable for most of the schools in the area, previous research provided justification for the assumption that such factors do not confound the study's results. Bodenhausen (1983), in her study of public high schools in the same area, found that student body effects have no significant relationship to advanced placement test scores; Coleman, Hoffer, and Kilgore (1982) found private schools more effective than public in minimizing the effect of differences in students' backgrounds.

The assumption that the results were unconfounded by earlier schooling experiences was supported by the random survey of schools' practices in admitting students to AP courses. It was also justified by the lack of sector effect in mathematics, an area in which students are unlikely to have had any previous subject matter exposure.

In the San Francisco Bay area where the majority of the

schools considered in this study are located, almost all non-public secondary schools have selective admissions policies. Because of this selectivity, one might expect the private school students to outperform those from public schools on tests such as the AP exams. This, however, was not the case.

Although in the sample as a whole private school students slightly, but not significantly, outperformed public school students, they did not do so in the subsamples. In both P/P and HDP2, the performance of public school students was slightly, but again not significantly, greater than that of private school students. When Catholic and non-Catholic private schools were considered separately, a different picture emerged. Catholic school students were greatly outperformed by public school students; in HDP2, the difference was significant at the .01 level. Public school students were, in turn, outperformed by "other private" school students; in HDP2, the difference was significant at the .05 level. In the latter case, the differential was probably influenced by the twice as great likelihood that an "other private" school in HDP2 had a highly developed program than that a public school did. However, since a Catholic school was nearly 10% more likely to have such a program than a public one, that factor could not explain the relatively poor performance of Catholic school students.

Further indication that sector effects may well be specious

is provided by the results of the math exams. Here again, the top performers were the public school students. However, in BC calculus, the mean score of the other private school students was significantly below that of public and Catholic school students.

Alexander writes (1987, p.53), "I conclude that sector effects on cognitive performance are small at best. In fact, I would not be at all surprised if they turned out to be entirely non-existant when properly studied." This research corroborates that conjecture.

This research also points to a factor in achievement which has been all but ignored in previous research --- program. In an area in which a large number of public and private schools compete with each other for students, the question of whether able students go to a school because of its program or whether the program has evolved to meet the needs of such students may be akin to that of whether the chicken or the egg came first. However, because of the significant difference in the achievement of students from schools with highly developed programs and that of students from other schools, the effect of program merits further investigation.

Conclusion

This study has implications for policy makers. Because it

shows that sector status has no significant influence on at least one aspect of student performance, it should raise questions for those who support the use of public monies to expand private education. Furthermore, because it also demonstrates that the type of program offered by a school has a significant influence on the performance of one group of students, it should spur interest in experiments which enable a school to offer a richer program than it would otherwise be able to afford.

TABLE 1

Mean Percent of Students in School Taking an AP Exam Passing the Exam

	Overall	Public	Private	Rural	HDP1
Mean	66.3	66.4	68.4	59.0	79.6**

	P/P	P/P public	P/P Catholic	P/P other private
Mean	69.0	69.1	66.6	71.5

	HDP2	HDP2 public	HDP2 Catholic	HDP2 other private
Mean	71.8*	72.3	66.1##	76.1#

	P/P composite private	HDP2 composite private
Mean	68.7	70.7

* significantly different from overall P/P value at .05 level
** significantly different from overall P/P value at .01 level
\# significantly different from HDP2 public value at .05 level
significantly different from HDP2 public value at .01 level

TABLE 2

Regression Results

Percent of Students Passing Exam Regressed on Sector and Number of Exams Given

Subsample P/P

variable	Coeff.	F-ratio	Prob.	Std. Error
public	-2.01	.265	.614	3.90
Catholic	-2.24	.217	.647	4.82
no. exams	.08	21.314*	.000	.02

* significant at .01 level

Subsample HDP2

variable	Coeff.	F-ratio	Prob.	Std. Error
public	-3.76	.968	.672	3.33
Catholic	-7.72	2.625	.103	4.76
no. exams	.06	15.279*	.000	.02

* significant at .01 level

TABLE 3

Mean Percent of Students in School Taking an AP Exam Passing the Exam --- By Subject

	Am. History	Biology	Chemistry	French
P/P mean	62.4	73.3	64.2	69.3
(no. schools)	(121)	(53)	(33)	(38)
Public mean	60.7	68.4	61.4	69.0
(no. schools)	(90)	(31)	(26)	(26)
Catholic mean	61.3	74.0	83.3	38.4*
(no. schools)	(16)	(10)	(1)	(4)
Other private mean	74.0	87.7	66.5	85.7
(no. schools)	(15)	(12)	(6)	(8)

	Eng. lang.	Eng. lit.	Spanish
P/P mean	64.0	68.4	80.7
(no. schools)	(39)	(144)	(71)
Public mean	60.6	65.9	80.4
(no. schools)	(28)	(112)	(53)
Catholic mean	79.7	72.6	68.9
(no. schools)	(5)	(19)	(9)
Other private mean	66.5	83.8*	94.0
(no. schools)	(6)	(13)	(9)

	Calculus AB	Calculus BC
P/P mean	78.1	76.9
(no. schools)	(104)	(34)
Public mean	78.3	80.7
(no. schools)	(76)	(26)
Catholic mean	75.4	80.0
(no. schools)	(15)	(1)
Other private mean	79.9	62.0*
(no. schools)	(13)	(7)

* significantly different from P/P value at .05 level

P/P sample size is 145 public, 32 Catholic, 24 other private.

TABLE 4

Regression Results for Math Subsamples

Percent of Students Passing Exam Regressed on Sector and Number of Exams Given -- Subsample MATH

variable	Coeff.	F-ratio	Prob.	Std. Error
no. exams	.0923	18.27*	.000	.0216 (~1.5 exams)

The Computer computed coefficients for no other variables
* significant at .01 level

Percent of Students Passing Exam Regressed on Sector and Number of Exams Given -- Subsample MATH/HDP2

Variable	Coeff.	F-ratio	Prob.	Std. Error
no. exams	.0357	14.54*	.001	.0225 (~1.3 exams)

The Computer computed coefficients for no other variables
* significant at .01 level

NOTES

1. In the opinion of the researcher, the situation is even worse than that implied by Willms' statement. Three of the seven HSB tests were designed solely as measures of basic skills in general mathematics, reading, and vocabulary. The common items from those tests, the only ones used in CHK's base-year analysis, could easily have been taken from one of the high school proficiency tests, specified to be at the eighth grade level developed by California school districts. The other four tests, specified to be curriculum-specific in more advanced mathematics, science, writing, and civics, comprised 10, 20, 17, and 10 items, respectively. As a mathematics teacher, the researcher is amazed that a test with only 10 questions could be considered to cover "advanced" high school mathematics; she suspects that teachers in the other disciplines might feel similarly.

2. Northern California specifically means those areas with zip codes beginning with 94, 95, and 96. Geographically, this region encompasses Santa Cruz and San Jose and areas to the north and east.

3. The number, five, is in a sense arbitrary. In a random telephone sample of Northern California high schools which gave at least one AP exam in 1987, it was, however, the minimum number of exams given by any school which indicated that it had an actual AP program.

4. Advanced placement exams are scored numerically from 1 to 5, 5 high. Colleges usually give credit toward graduation for scores of 3 or better; thus, scores of 3, 4, and 5 are often termed "passing."

5. The aggregate student data was collected as a part of a previous study (Bodenhausen, 1988). Relevant findings will be discussed in the Discussion section.

6. Because in some, but not all Catholic schools, class sizes may equal those of public schools, this subsample could include some Catholic schools without highly developed programs. All of these are included in HDP2 by zipcode.

7. It should be noted that there are high schools, both public and private, within the geographic area defined by HDP2 that are not in the subsample because they gave from 0 - 4 AP exams in 1987.

8. See the Discussion section for clarification of this point.

9. Two different AP calculus exams are offered. The AB exam covers approximately 1 semester of college calculus; the BC exam covers between 2 quarters and 2 semesters.

10. The precalculus math curriculum in the United States is relatively standard: two years of algebra, one year of geometry, a year of math analysis (the title of this course varies), and about one-third of a year of trigonometry included in either the third or the fourth year.

11. Precalculus texts provide, at most, an intuitive introduction to the calculus. That teachers were not providing their own supplements was checked in a random survey of calculus teachers at 12 schools offering BC calculus. In none of the twelve were students taught any calculus prior to enrolling in AP. The researcher is aware that at one large Southern California high school, students may take AB calculus in their junior year and BC in their senior year. In Northern California, no one had heard of the practice.

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